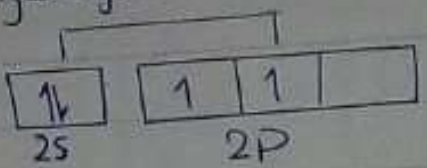


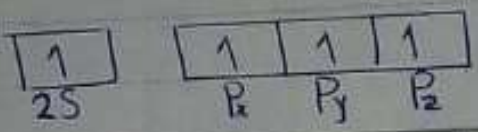
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Organic Chemistry: is the chemistry deals with compounds containing Carbon & hydrogen.

$_{6}^{12}C$ $1s^2$, $2s^2, 2p^2$



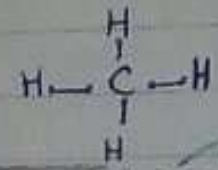
ground state.



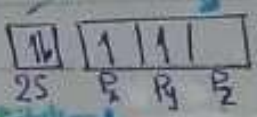
excited state.

Hybridization:-

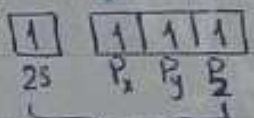
- [1] sp^3 - Hybridization (ex) → CH_4



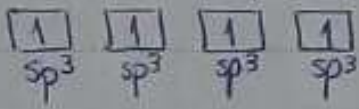
$_{6}^{12}C$ ground state ⇒ $1s^2$, $2s^2, 2p^2$



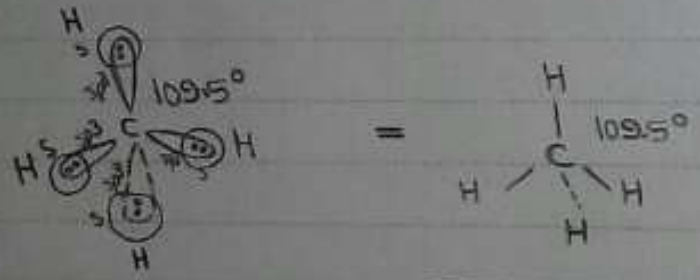
excitation



hybrid Orbitals



* Shape: tetrahedral.
* Angle: 109.5°

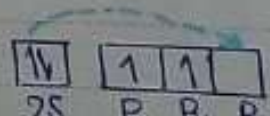


4 σ bond (sp^3_s)

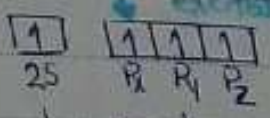
---

[2] sp^2 - Hybridization. (ex) → $CH_2 = CH_2$

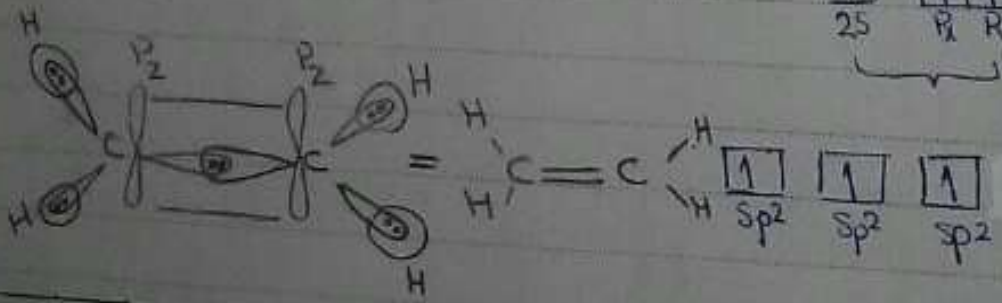
$_{6}^{12}C$ ground state ⇒ $1s^2$, $2s^2, 2p^2$



excitation



* Shape: planer
* Angle: 120°





الإلكترون الطائر

hybrid Orbitals

3 σ bond (sp^2_s)

1 π bond (P_z-P_z)

/ /

[3] sp - Hybridization. (C_2H_2) → $CH \equiv CH$

$_6^{12}C$ ground state

- Shape : linear.
- Angle : 180°.

2S	P_x	P_y	P_z
↑↓	1	1	

excitation

2S	P_x	P_y	P_z
1	1	1	1

أثلوضي بطاقة ←

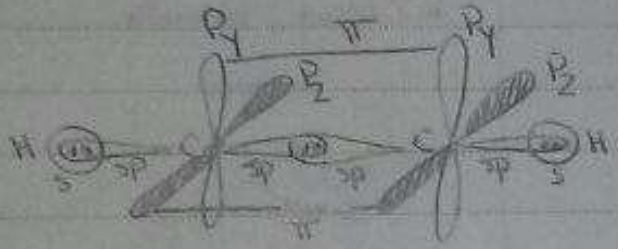
P_y	P_z
1	1

sp	sp
1	1

← hybrid Orbitals

σ → strong bond
π → weak bond
(تنتج عن تداخل محاور غير موجهة طاقة عالية وتكون محدودة على المستوى ↳ (P_y or P_z))

2 σ bonds (sp-s)
2 π bonds (P_y-P_y) (P_z-P_z)



=

$H-C \equiv C-H$

---

* Determine the type of hybridization of the stared Carbon:-

(a) $CH_3-\overset{*}{C}H=CH-CH_3$ ← رابطة مزدوجة / رابطة ثنائية

(a) sp^2

(b) $CH_3-CH_2-C\equiv\overset{*}{C}H$ ← رابطة ثلاثية

(b) sp

(c) $CH_3-\overset{*}{C}H(CH_3)-CH_2-CH_3$ ← جميع الروابط أحادية

(c) sp^3

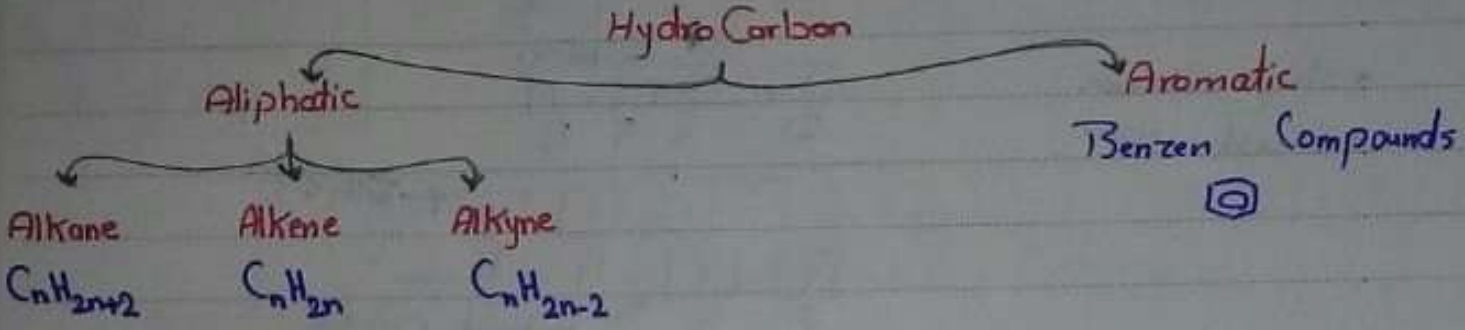
(d) $CH_2-CH=\overset{*}{C}=CH_2$

(d) sp ← رابطتين π

* رابطتين π أو رابطة ثلاثية يفقد التجين من النوع (sp)

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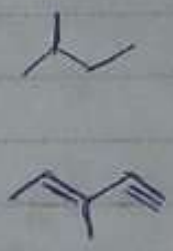
HydroCarbonCompounds: are Compounds containing Carbon & hydrogen only.



C-Chain structure :-

* Condensed formula.
  - CH_3-CH_3
  - $CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-CH_2-CH_3$
  - $CH_3-CH=\overset{\displaystyle CH_3}{\overset{|}{C}}-C\equiv CH$

* Zigzag formula.



Alkane: C_nH_{2n+2}

IUPAC nomenclature.

CH_4	methane
——	ethane
∧	Propane
∧∧	Butane
∧∧∧	Pentane
CH_2	hexane
CH_3	heptane
CH_4	Octane

Alkane $C_nH_{2n+2} \xrightarrow{-H}$ Alkyl

$CH_4 \rightarrow CH_3$ methyl

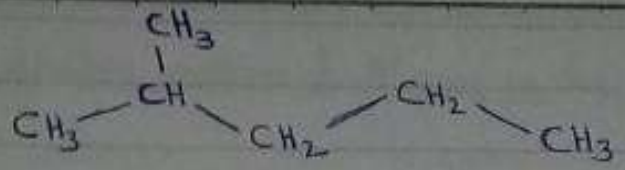
$CH_3\ CH_3 \rightarrow CH_3CH_2$ ethyl

$CH_3-CH_2-CH_3 \rightarrow CH_3-CH_2-CH_2$ propyl

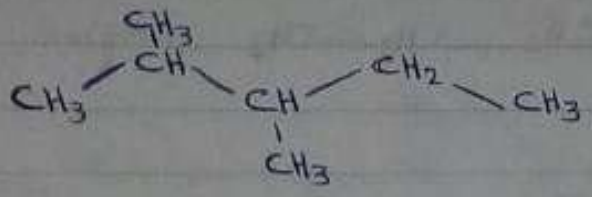
Di	→ 2
Tri	→ 3
Tetra	→ 4

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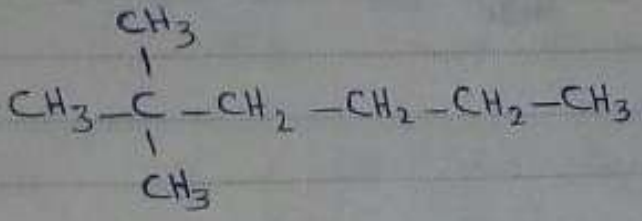
Scanned by CamScanner



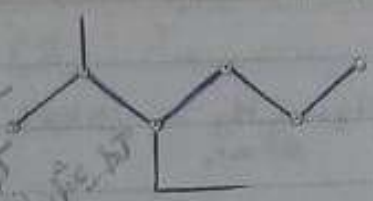
2-Methyl Pentane



2,3 dimethyl Pentane



2,2 Dimethyl hexane

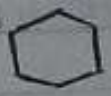


3-ethyl -2-methyl hexane

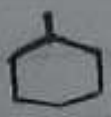
Cyclo- alkane C_nH_{2n}



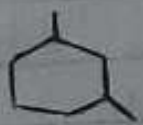
Cyclo Pentane



Cyclo-hexane



methyl Cyclohexane



1,3 dimethyl Cyclohexane

- أثناء البحث عن أطول سلسلة كربونية متصلة
- نقوم بالترقيم بحيث نحصل على أصغر رقم
- ترتب الفروع أبجدياً عند كتابة الاسم المركب بحيث يكتب ethyl قبل الـ methyl
- عند وجود فرعين متماثلين يكتب المقطع Di قبل اسم الفرع ويكتب رقمي الفرعين حتى لو كانا متتاليين مثل 2,2 Dimethyl
- تفصل بين الأرقام "," وبين الأرقام والحروف بـ "-"

Preparation of Alkane:

[1] Catalytic hydrogenation:

(a) Reduction of Alkene:

$$CH_3-CH=CH_2 \xrightarrow[Ni]{H_2} CH_3-CH_2-CH_3$$ Propane

(b) Reduction of Alkyl halides:

$$CH_3-\underset{Br}{CH}-CH_2-CH_3 \xrightarrow[HBr]{Zn} CH_3-CH_2-CH_2-CH_3$$ Butane

---

[2] Wurtz Reaction:

Reaction of Alkyl halide with "Na" metals.

$$2R-X + 2Na \longrightarrow R-R + 2NaX$$

$X = \{Cl, Br, I\}$

ex: $2CH_3-Cl + 2Na \longrightarrow \underset{\text{ethane}}{CH_3-CH_3} + 2NaCl$

$\Rightarrow 2CH_3CH_2-Br + 2Na \longrightarrow \underset{\text{butane}}{CH_3-CH_2-CH_2-CH_3} + 2NaBr$

---

[3] Kolbe Synthesis of Alkane:

* $2CH_3-COOK \xrightarrow{\text{electrolysis}} CH_3-CH_3 + 2CO_2 + K$

Potassium accilate. ethane

* $2CH_3-CH_2-COONa \xrightarrow{\text{electrolysis}} CH_3-CH_2-CH_2-CH_3 + 2CO_2 + Na.$

Sodium propionate Butane

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* Halogenation reaction of Alkanes in the presence of light.

General : $R-H \xrightarrow[\text{light}]{Cl,Br \leftarrow X_2} R-X + HX$

Rule :- $CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{CH}} > CH_3-\overset{\overset{CH_3}{|}}{CH} > CH_3-CH > CH$

$3^{\circ}H > 2^{\circ}H > 1^{\circ}H$

- $CH_3-CH_2-CH_3 \xrightarrow[h\nu]{Cl_2} CH_3-\overset{\overset{Cl}{|}}{CH}-CH_3 + HCl$

- $CH_3-\overset{\overset{CH_3}{|}}{CH}-CH_2-CH_3 \xrightarrow[h\nu]{Br_2} CH_3-\underset{\underset{Br}{|}}{\overset{\overset{CH_3}{|}}{C}}-CH_2-CH_3 + HBr$

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Alkene: (C_nH_{2n}) are charactrized by Carbon-Carbon double bond.

IUPAC nomenclature: Alkane → Alkene

↳ The lowest possible number for double bond

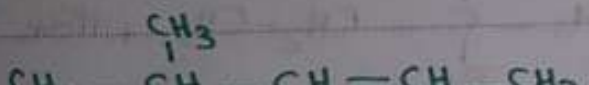
* الأولوية للرابطة المزدوجة في إعطاء رقم.

$CH_2 = CH_2$
ethene

$CH_3 - CH = CH_2$
Propene

$CH_3 - CH_2 - CH = CH_2$
1-Butene

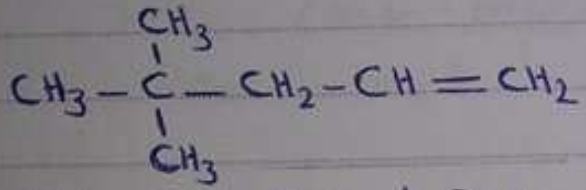
$CH_3 - CH_2 = CH - CH_3$
2-Butene


4-methyl 2-pentene

* نبدأ الترقيم من الطرف الذي يعطي أصغر عدد للرابطة، بغض النظر عن الفروع.


2-methyl 3-hexene

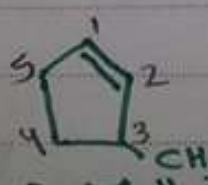
* لو الرابطة في النص نفضل الرقم من الطرفين نرقم من الطرف الذي يعطي أصغر عدد للفروع

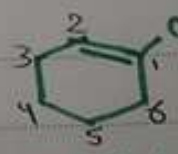

4,4 - Dimethyl - 1-Pentene

$CH_3 - CH = CH - CH = CH_2$
1,3 - Pentadiene

عند وجود رابطتين يوضع المقطع di بين عدد السلسلة الكربونية والمقطع المميز للألكينات ← Penta (di) ene


Cyclopentene


3-Methyl-1-Cyclo pentene


1-Methyl-
1-Cyclohexene

* عند الترقيم في حالة الألكين الحلقي يجب أن يعطي الرقمين 1، 2 للرابطة.

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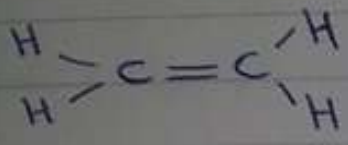
الأشكال الهندسية

Geometric isomers : → خاصية تتميز بها الألكينات فقط

هذه الألكانات لا تحتوي على رابطة ثنائية ،

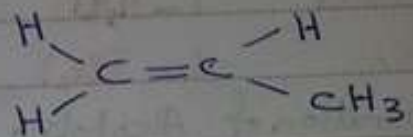
الألكاينات وصفرها الفراغي خط مستقيم زاوية 180 ← يعني مجموعتين X Y على خط واحد.

في الألكينات يبقى مجبور على شكل فراغي planer وزاوية 120°



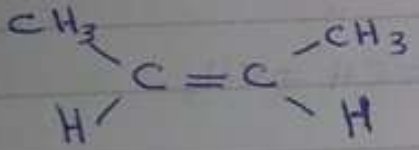
ethene

ليس له شكل هندسي / لأن ذرتين الكربون تحمل نفس مجموعة H



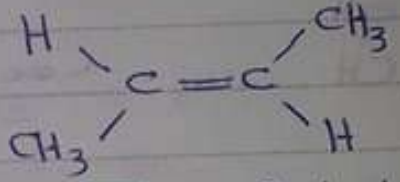
Propene

ليس له شكل هندسي / لأن هناك ذرة كربون تحمل نفس مجموعة H



Cis – 2 – butene

لو مجموعتين متشابهتين (Cis) في نفس الاتجاه



Trans – 2 – butene

لو مجموعتين متشابهتين (Trans) في اتجاهين مختلفين

شرط وجود شكل هندسي أن ذرتين الكربون على طرفي الرابطة الثنائية يحملان مجموعتين مختلفتين .

$CH_2=CH_2$ ethene ✗

$CH_3-CH=CH_2$ Propene ✗

$CH_3-CH_2-CH=CH_2$ 1-butene ✗

$CH_3-CH=CH-CH_3$ 2-butene ✓

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Preparation methods: → how to make the double bond:



① X = H, Y = OH ($-H_2O$)

② X = H, Y = Cl ($-HCl$)

③ X = Y = Br ($-Br_2$)

[1] Dehydration of Alcohols: (R–OH)

* $CH_2(H)-CH_2(OH) \xrightarrow[-H_2O]{\text{Conc } H_2SO_4} CH_2=CH_2$

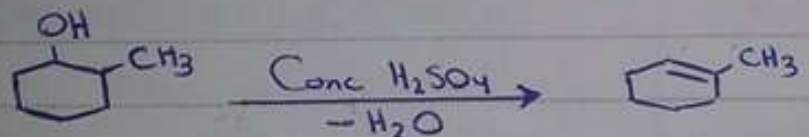
ethanol → ethene

* يتم إزالة الهيدروجين من ذرة الكربون المجاورة لذرة الكربون التي تحمل مجموعة الهيدروكسيل.

* $CH_2(H)-CH(OH)-CH_3 \xrightarrow[-H_2O]{\text{Conc } H_2SO_4} CH_2=CH-CH_3$

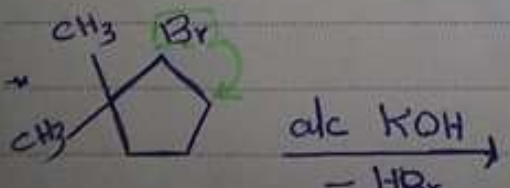
* $CH_3-CH(OH)-CH_2-CH_3 \xrightarrow[-H_2O]{\text{Conc } H_2SO_4} CH_3-CH=CH-CH_3$

Saztef rule: elemination of hydrogen from C-atom of the lowest number. → لعنصر ذو الرقم الأقل.

* 

[2] Dehydrohalogenation of Alkyl halides (R–X)

* $CH_3-CH(Cl)-CH(CH_3)-CH_3 \xrightarrow[-HCl]{\text{alc. KOH}} CH_3-CH=C(CH_3)-CH_3$

* 

3,3-Dimethyl-1-Cyclopentene.

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geminal dihalides $X-\overset{X}{\underset{|}{C}}-$

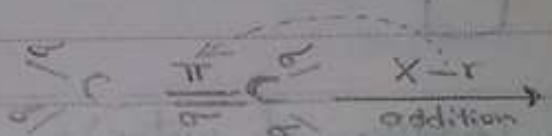
[3] Dehalogenation of vicinal dihalides ($-\overset{X}{\underset{|}{C}}-\overset{X}{\underset{|}{C}}-$):

General reaction: $-\overset{X}{\underset{|}{C}}-\overset{X}{\underset{|}{C}}- \xrightarrow[X: Cl, Br, I]{Zn \cdot \Delta} >C=C< + ZnX_2$

$R-\overset{Br}{\underset{|}{C}}H-\overset{Br}{\underset{|}{C}}H-CH_3 \xrightarrow[-ZnBr_2]{Zn \cdot \Delta} R-CH=CH-CH_3$

Alkene.

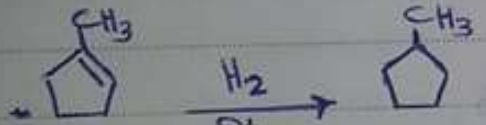
Chemical reaction:



[1] Addition of hydrogen (Catalytic reduction):

* $R-CH=CH-CH_3 \xrightarrow[Ni]{H_2} R-CH_2-CH_2-CH_3$

Alkene (unsaturated). Alkane (saturated).



1-Methyl Cyclopentene

Methyl-Cyclopentane.

[2] Halogenation (Addition of halogen):

General: $R_1-CH=CH-R_2 \xrightarrow[Solvent]{X_2} R_1-\overset{X}{\underset{|}{C}}H-\overset{X}{\underset{|}{C}}H-R_2$

ex 3 → $CH_3-CH=CH-CH_3 \xrightarrow[Benzene]{Cl_2} CH_3-\overset{Cl}{\underset{|}{C}}H-\overset{Cl}{\underset{|}{C}}H-CH_3$

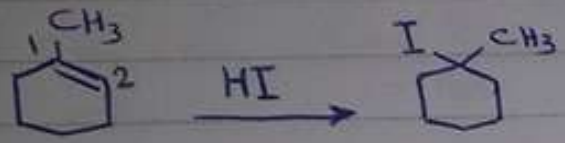
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[3] Addition of hydrogen halide : (H → X)

* $CH_2 = CH_2 \xrightarrow{HBr} CH_3 - CH_2Br$

* $CH_3 - \underset{\displaystyle CH_3}{\overset{\displaystyle |}{C}} = CH_2 \xrightarrow{HCl} CH_3 - \underset{\displaystyle Cl}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}} - CH_3$

Markonikouls rule : Hydrogen is added to C-atom of the highest number of hydrogen. → اختي بزيادتي

* 

[4] Hydration of Alkene (Addition of water):

General = $-CH=CH- \xrightarrow[\Delta]{dil\ H_2SO_4} -\overset{\displaystyle H}{\underset{|}{C}}H - \overset{\displaystyle OH}{\underset{|}{C}}H-$

* $CH_3-CH=CH_2 \xrightarrow[\Delta]{dil\ H_2SO_4} CH_3 - \overset{\displaystyle OH}{\underset{|}{C}}H - CH_3$

* $CH_3 - \underset{\displaystyle CH_3}{\overset{\displaystyle |}{C}} = CH_2 \xrightarrow[\Delta]{H_2O/H^+} CH_3 - \underset{\displaystyle OH}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}} - CH_3$

Mechanism:

$CH_3 - \underset{\displaystyle CH_3}{\overset{\displaystyle |}{C}} = CH_2 \xrightarrow{H^+} CH_3 - \underset{\displaystyle CH_3}{\overset{\displaystyle |}{\overset{\oplus}{\underset{|}{C}}}} - CH_3$ (intermediate) (or) $CH_3 - \underset{\displaystyle CH_3}{\overset{\displaystyle |}{C}}H - \overset{\oplus}{CH_2}$

3°_Carbocation > 1°-Carbocation

$CH_3 - \underset{\displaystyle CH_3}{\overset{\displaystyle |}{\overset{\displaystyle |}{\underset{|}{C}}}} - CH_3 \xleftarrow{-H^+} CH_3 - \underset{\displaystyle CH_3}{\overset{\displaystyle |}{\overset{\displaystyle |}{\underset{|}{C}}}} - CH_3 \xleftarrow{H_2\ddot{O}|} \underset{\displaystyle H}{\overset{\displaystyle H}{\overset{|}{\underset{|}{O^{\oplus}}}}}$

Mark product

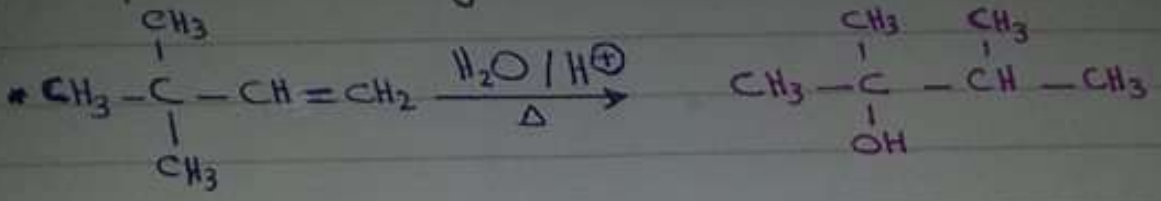
Rule : $CH_3 - \underset{\displaystyle CH_3}{\overset{\displaystyle |}{\overset{\oplus}{\underset{|}{C}}}} - CH_3 > CH_3 - \underset{\displaystyle CH_3}{\overset{\displaystyle |}{\overset{\oplus}{\underset{|}{C}}}}H > CH_3 - \overset{\oplus}{CH_2}$

3° Carbocation > 2° Carbocation > 1° Carbocation

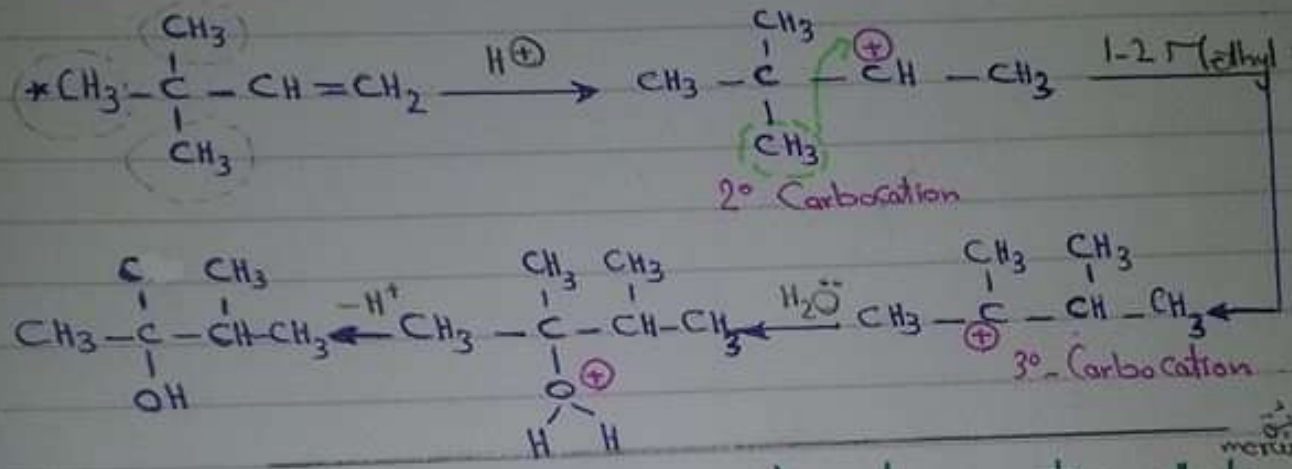
more stable

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Complete the following reactions : Discuss the mechanism :

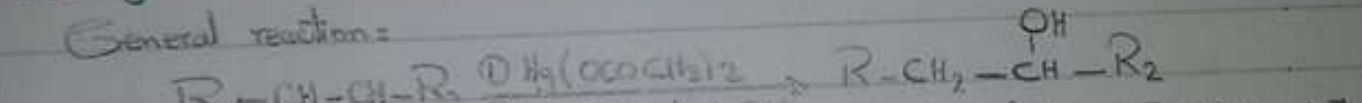


Mechanism :

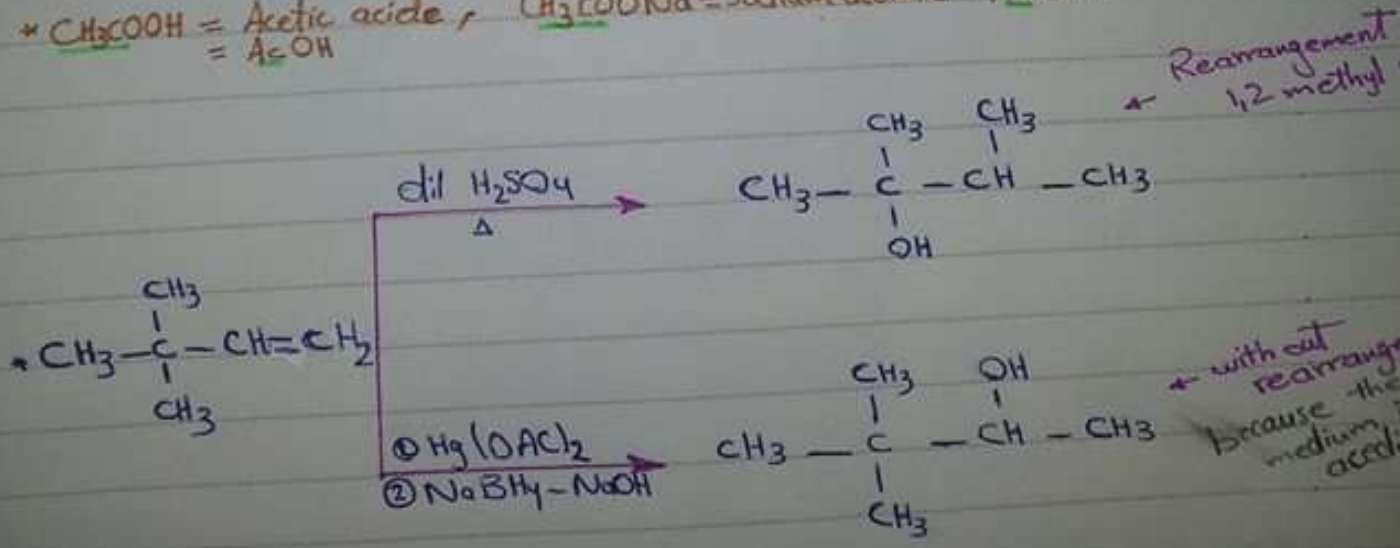


[5] Hydration of Alkene by oxymercuration-demercuration method :

General reaction :



* $Hg(OCOCH_3)_2$ = Mercuric acetate = $Hg(OAc)_2$
* $NaBH_4$ = Sodium boron hydride
* CH_3COOH = Acetic acide, CH_3COONa = Sodium acetate = AcONa
  = AcOH



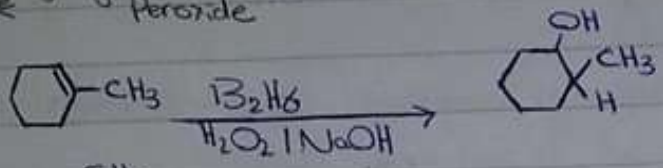
- لو طلب تحويل الألكين إلى كحول ← أشوف الهيدرة "Hydration" ← يوجد نوعان
مثلاً Acid medium ← أستخدم طريقة Mark rule / /
لو Anti Mark rule ← يوجد طريقة واحدة فقط H_2O

[6] Hydration of Alkene by Hydroboration–oxidation method (Anti Mark rule)

General: $R-CH=CH_2 \xrightarrow[②\ H_2O_2 / NaOH]{①\ B_2H_6} R-CH_2-CH_2-OH$ (Anti. Mark rule)

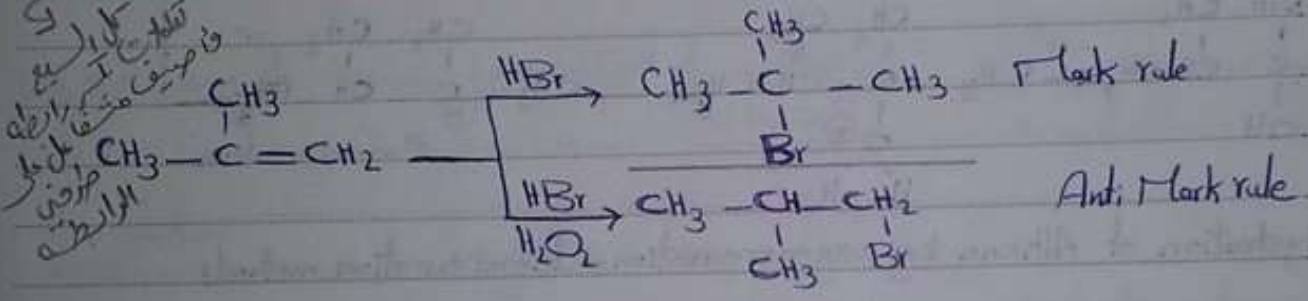
Anti Mark ← hydrogen Peroxide

Example: ①



② $CH_3-\underset{CH_3}{C}=CH-CH_3 \xrightarrow[H_2O_2/NaOH]{B_2H_6} CH_3-\underset{CH_3}{CH}-\underset{OH}{CH}-CH_3$

[7] Addition of HX "hydrogen halide" by Anti Mark rule:



[8] Ozonolysis of Alkenes (Rx with ozon O_3)

General: $\begin{matrix} R_3 & & R_1 \\ & C=C & \\ R_4 & & R_2 \end{matrix} \xrightarrow[②\ Acid]{①\ O_3/Zn} \begin{matrix} R_3 \\ R_4 \end{matrix}C=O + O=C\begin{matrix} R_1 \\ R_2 \end{matrix} + ZnO$ (Zinc Oxide)

Example:

① $CH_3-\underset{CH_3}{C}=CH-CH_3 \xrightarrow[②\ Acid]{①\ O_3/Zn} CH_3-\underset{CH_3}{C}=O + O=CH-CH_3 + ZnO$

Acetone — Acetaldehyde

②  $\xrightarrow[AcOH]{O_3/Zn}$  $+ O=CH-CH_3 + ZnO$

Cyclohexanone — Acetaldehyde

Acetic acid

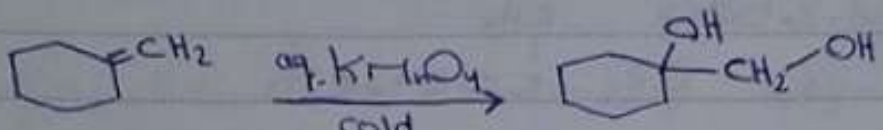
CH_3COOH

$AcOH$

[5] Action of Potassium Permanganate ($KMnO_4$)

(a) Reaction with aq. $KMnO_4$ on cold (Hydroxlation). + 2OH إضافة مجموعتي الهيدروكسيل الرابطة ثنائي الهيدروكسيل

① $CH_3-CH=\overset{CH_3}{\overset{|}{C}}-CH_3 \xrightarrow{aq.KMnO_4} CH_3-\underset{OH}{\overset{|}{CH}}-\underset{OH}{\overset{|}{\overset{CH_3}{\overset{|}{C}}}}-CH_3$

②  $\xrightarrow[\text{cold}]{aq.KMnO_4}$

(b) Reaction with basic aq. $KMnO_4$ on heating: كيتون حمض الكربوكسيليك ثنائي

General: $R_3-\overset{R_2}{\overset{|}{C}}=CH-R_1 \xrightarrow[NaOH\ /\Delta]{aq.KMnO_4} R_3-\overset{R_2}{\overset{|}{C}}=O + HOOC-R_1$

Ketone — Acid

Ex

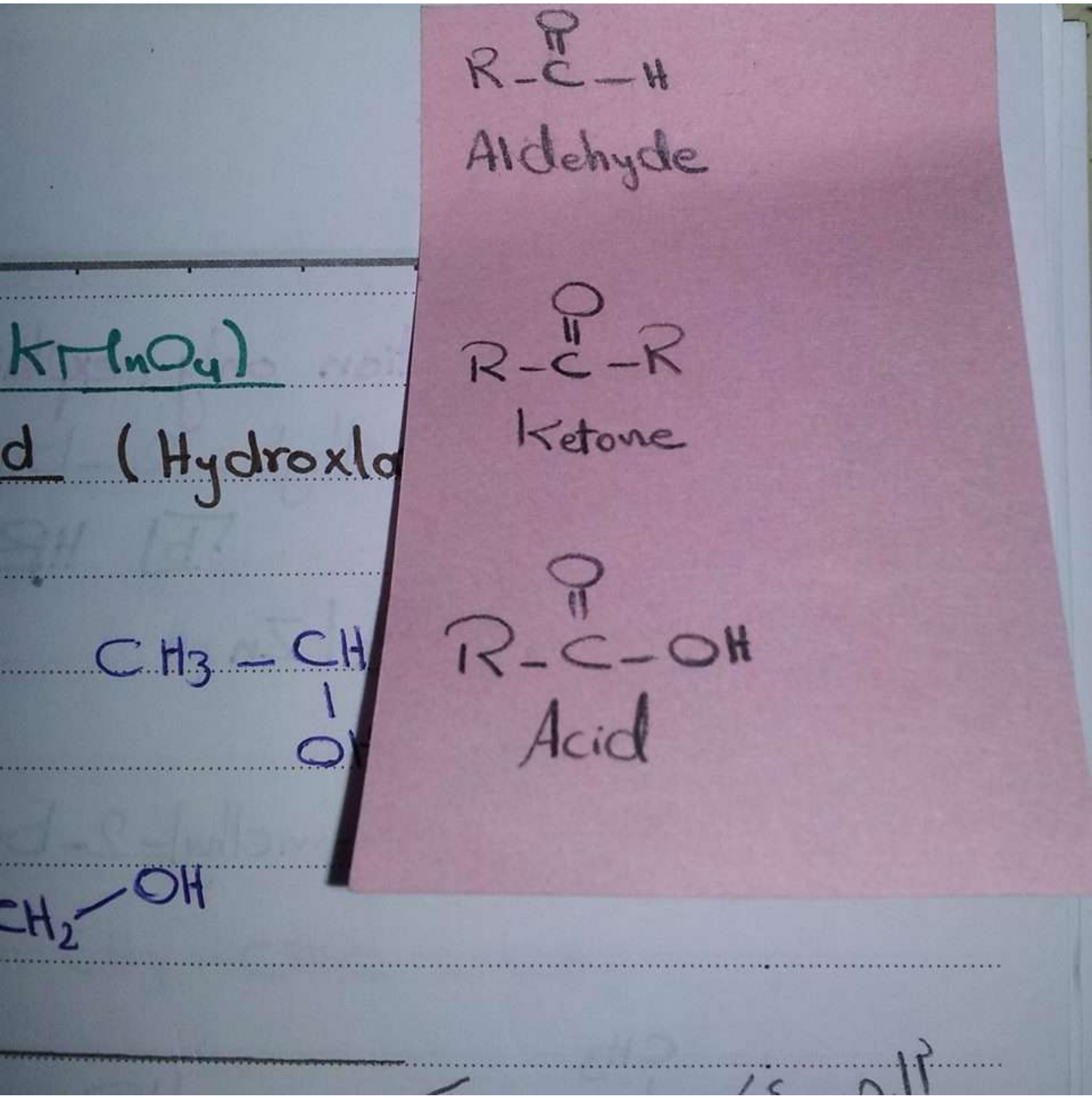
① $CH_3-\overset{CH_3}{\overset{|}{C}}=CH-CH_3 \xrightarrow[NaOH\ /\Delta]{aq.KMnO_4} CH_3-\overset{CH_3}{\overset{|}{C}}=O + HOOC-CH_3$

Acetone — Acetic Acid

② $CH_3-\overset{CH_3}{\overset{|}{C}}=\overset{CH_3}{\overset{|}{C}}-CH_3 \xrightarrow[NaOH\ /\Delta]{aq.KMnO_4} 2\ CH_3-\overset{CH_3}{\overset{|}{C}}=O$

Acetone

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* By chemical equation only, explain the action of the following reagent on 2-methyl-2-butene. :—

[a] HBr [b] HBr / H_2O [c] dil H_2SO_4

[d] O_3/Zn [e] aq $KMnO_4$ / NaOH / Δ

Answer

2-methyl-2-butene

$CH_3-\overset{CH_3}{\overset{|}{C}}=CH-CH_3$

[a] $CH_3-\overset{CH_3}{\overset{|}{C}}=CH-CH_3 \xrightarrow{HBr} CH_3-\overset{CH_3}{\overset{|}{\underset{Br}{\underset{|}{C}}}}-CH_2-CH_3$ Mark rule

[b] $CH_3-\overset{CH_3}{\overset{|}{C}}=CH-CH_3 \xrightarrow[H_2O_2]{HBr} CH_3-\overset{CH_3}{\overset{|}{CH}}-\overset{Br}{\overset{|}{CH}}-CH_3$ Anti Mark's rule

[c] $CH_3-\overset{CH_3}{\overset{|}{C}}=CH-CH_3 \xrightarrow{dil\ H_2SO_4} CH_3-\overset{CH_3}{\overset{|}{\underset{OH}{\underset{|}{C}}}}-CH_2-CH_3$ Mark rule

[d] $CH_3-\overset{CH_3}{\overset{|}{C}}=CH-CH_3 \xrightarrow{O_3/Zn} CH_3-\overset{CH_3}{\overset{|}{C}}=O + O=CH-CH_3 + ZnO$ Anti Mark rule

Acetone Acetaldehyde

[e] $CH_3-\overset{CH_3}{\overset{|}{C}}=CH-CH_3 \xrightarrow[NaOH/\Delta]{aq.\ KMnO_4} CH_3-\overset{CH_3}{\overset{|}{C}}=O + HOOC-CH_3$

Acetone Acetic Acid

* What's the alkene which gives 1 mole of Acetone & 1 mole of Propionaldehyde on Ozonolysis?

Answer :-

O_3/Zn

$CH_3-\overset{CH_3}{\overset{|}{C}}=CH-CH_2-CH_3 \xrightarrow{O_3/Zn} CH_3-\overset{CH_3}{\overset{|}{C}}=O + O=CH-CH_2-CH_3$

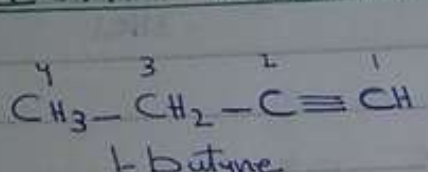
Alkene Acetone Propionaldehyde

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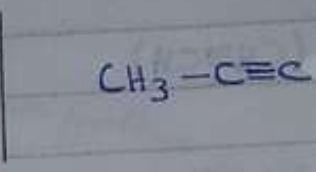
Alkynes

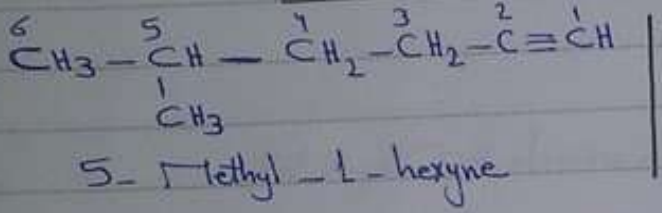
Alkynes: are hydrocarbons which contain triple bond.
- They have general formula C_nH_{2n-2}

IUPAC nomenclature:

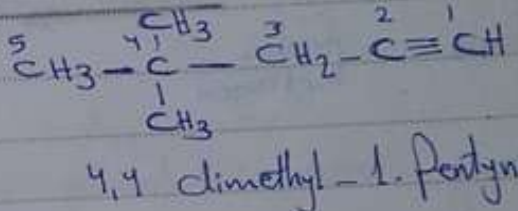


1-butyne

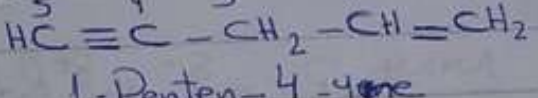




5-Methyl-1-hexyne



4,4 dimethyl-1-pentyne

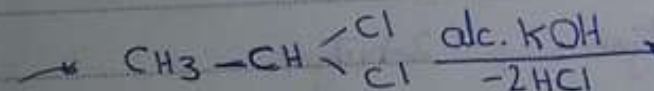


1-Penten-4-yne

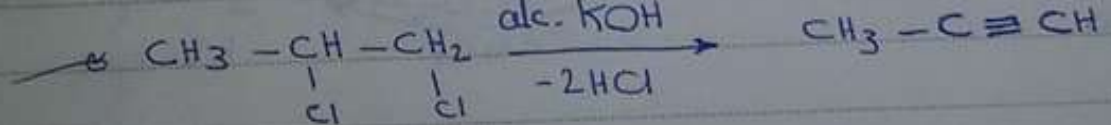
- في حال وجود رابطة ثنائية ورابطة ثلاثية في نفس المركب تكون الأولوية للرابطة الثلاثية

Preparation methods: how to make triple bond.

1. Dehydrohalogenation (-2HX) → must be dihalid.



geminal dihalide



Vicinal dihalide

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CH_3-CH_2OH

Ethanol

Ethanol

ol

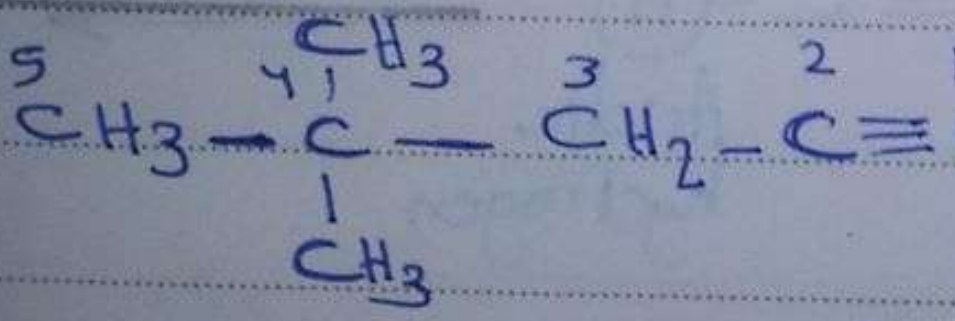
Ethanol

nes

ch contain triple

nula C_nH_{2n-2}

$CH_3-C\equiv C-CH_3$



4,4 dimethyl – 1. Pentyne

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How could you convert 2-Butene ⟶ 2-butyne.

Answer:

$CH_3-CH=CH-CH_3 \xrightarrow{Cl_2} CH_3-\underset{Cl}{CH}-\underset{Cl}{CH}-CH_3$

$CH_3-C\equiv C-CH_3 \xleftarrow[-2HCl]{Alc\ KOH}$ (the dichloride)

---

[2] from acetylene ($CH\equiv CH$)

$H-C\equiv C-\overset{\delta+}{(H)} \xrightarrow{NaOH} H_2O + H-C\equiv C^{\delta-}-Na^{\delta+}$

(strong base)

Acetylene — Acidic hydrogen

Strong base = $NaNH_2$ (أقوى) Sodium amide, KOH, Na^+

General: $R-C\equiv C-H \xrightarrow[-NH_3]{NaNH_2} R-C\equiv C^{\delta-}-Na^{\delta+} \xrightarrow[-NaCl]{R_1-Cl} R-C\equiv C-R_1$ higher alkyne

(2) $CH_3-C\equiv CH \xrightarrow{Na} CH_3-C\equiv C^{\delta-}-Na^{\delta+}$

1-Propyne

$CH_3-C\equiv C-CH_3 \xleftarrow[-NaCl]{CH_3-Cl}$

2-butyne

Convert acetylene to:- 1-butyne , 2-butyne

Answer:

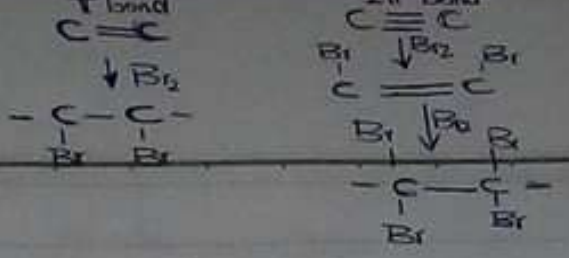
① $HC\equiv CH \xrightarrow{NaNH_2} Na^+C^-\equiv CH \xrightarrow[-NaCl]{CH_3-CH_2-Cl} CH_3-CH_2-C\equiv CH$

Acetylene — 1-butyne

② $HC\equiv CH \xrightarrow[CH_3Cl]{NaNH_2} H-C\equiv C-CH_3 \xrightarrow[CH_3Cl]{NaNH_2} CH_3-C\equiv C-CH_3$

Acetylene — 2-butyne

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Reaction of Alkynes:

[1] Addition of halogen: (X_2 = Cl_2 or Br_2).

e.g. $CH_3-C\equiv CH \xrightarrow[CCl_4]{Br_2} CH_3-\underset{Br}{\overset{Br}{C}}=CH \xrightarrow[CCl_4]{Br_2} CH_3-\underset{Br}{\overset{Br}{C}}-\underset{Br}{\overset{Br}{CH}}$

Tetra bromo propane

e.g. $CH_3-C\equiv C-CH_3 \xrightarrow[Benzene]{2Br_2} CH_3-\underset{Br}{\overset{Br}{C}}-\underset{Br}{\overset{Br}{C}}-CH_3$

[2] Reduction of Alkynes: (Hydrogenation)

لتفاعل الهيدروجين في وجود النيكل كعامل حفاز.

$R-C\equiv C-R_1 \xrightarrow[Ni]{H_2} \underset{\text{Alkene}}{R-CH=CH-R_1} \xrightarrow[Ni]{H_2} \underset{\text{Alkane}}{R-CH_2-CH_2-R_1}$

Alkyne

e.g. $CH_3-C\equiv C-CH_3 \xrightarrow[Ni]{H_2} CH_3-CH=CH-CH_3$

2-butyne → 2-butene

[3] Addition of hydrogen halide (H-x):

$CH_3-C\equiv CH \xrightarrow{HBr} CH_3-\underset{Br}{\overset{}{C}}=CH_2 \xrightarrow{HBr} CH_3-\underset{Br}{\overset{Br}{C}}-CH_3$

2,2 dibromo propane
geminal dihalide.

[4] Hydration of Alkynes: —

→ gives ketone or aldehyde

$CH_3-C\equiv CH \xrightarrow[\text{dil. } H_2SO_4]{HgSO_4} \left[CH_3-\underset{}{\overset{OH}{C}}=CH_2\right] \longrightarrow CH_3-\overset{O}{\overset{\|}{C}}-CH_3$

(or H_2O/H^+)

unstable (Enol) Compound

Acetone

"En: =, ol: Alcohol"

$CH\equiv CH \xrightarrow[\text{dil. } H_2SO_4]{HgSO_4} \left[\overset{OH}{\underset{}{CH}}=CH_2\right] \longrightarrow \overset{O}{\overset{\|}{C}}H-CH_3$

Acetaldehyde

ALADDIN.net
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[5] Ozonolysis:

$$R-\underset{\underset{R}{|}}{C}=CH-R \xrightarrow{O_3/Zn} R-\underset{\underset{R}{|}}{C}=O + O=CH-R$$

Alkene → Ketone + aldehyde

$$R-\underset{\underset{R}{|}}{C}=CH-R \xrightarrow[\Delta/OH^-]{KMnO_4} R-\underset{\underset{R}{|}}{C}=O + HOOC-R$$

Ketone + Acid

$$R-C\equiv C-R \xrightarrow[\Delta/OH^-]{KMnO_4} \xrightarrow{O_3} R-COOH \quad HOOC-R$$

Alkyne → Carboxylic acid

General:

$$R-C\equiv C-R_1 \xrightarrow[AcOH]{O_3/Zn} R-COOH + HOOC-R_1$$

$$\xrightarrow[NaOH]{1.\ KMnO_4/\Delta} \uparrow$$

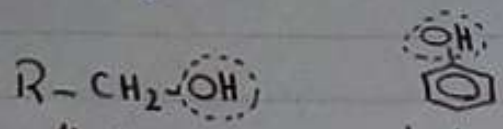
e.g. $CH_3-C\equiv C-CH_2-CH_3 \xrightarrow[AcOH]{O_3/Zn} CH_3-COOH + HOOC-CH_2-CH_3$

Acetic acid. Propionic acid.

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Alcohols (R-OH)

Are organic compounds in which hydroxyl group is attached to aliphatic chain.



Alcohol

not alcohol → Phenol

IUPAC nomenclature: (-ane/-ene/-yne) → -anol

↳ OH → lowest number.

CH_3OH methanol	CH_3-CH_2-OH Ethanol	$CH_3-CH_2-CH_2-OH$ 1-propanol
$CH_3-CH(OH)-CH_3$ 2-propanol	$CH_3-CH(CH_3)-CH(OH)-CH_3$ 3-methyl-2-butanol	
$CH_2=CH-CH(OH)-CH_3$ 3-buten-2-ol (but-3-en-2-ol)	$CH\equiv C-CH_2-OH$ 2-propyn-1-ol	

Comman names: (Alkyl alcohol).

CH_3-OH methyl alcohol	CH_3-CH_2-OH Ethyl alcohol	$CH_3-CH_2-CH_2-OH$ Propyl alcohol

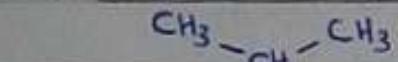
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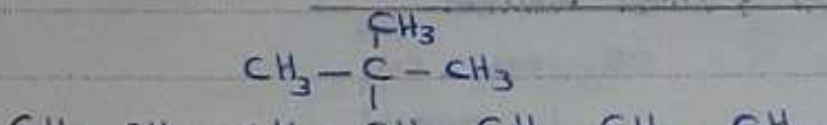
Alkyl

isoalkyl

t. alkyl



3-isopropyl heptane



4-t.butyl heptane

- Classification of alcohols:

$R-CH_2-OH$

Primary alcohol = 1° alcohol

$R-CH(R)-OH$

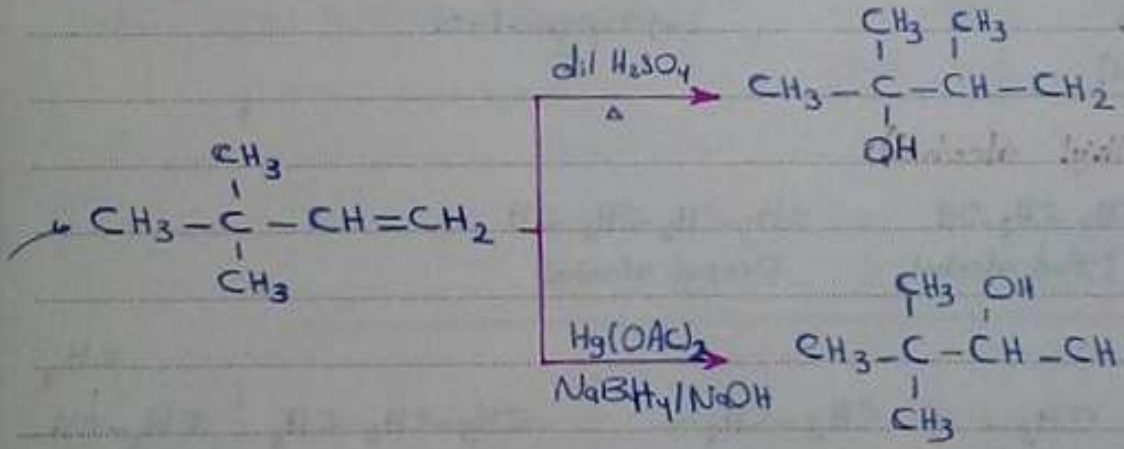
Secondary alcohol = 2° alcohol

$R-C(R)(R)-OH$

tertiary alcohol = 3° alcohol

Synthesis of alcohols:-

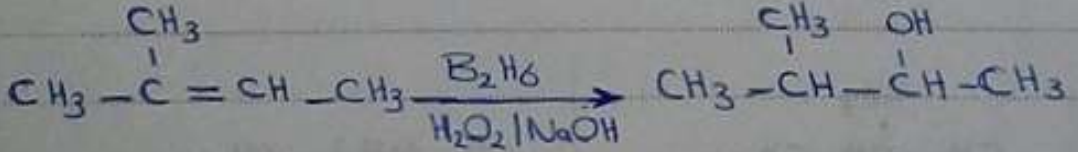
[1] Hydrolysis of alkenes:



→ rearrangement

1,2 methyl shift.

→ without rearrangement because the medium isn't acidic



* Anti mark rule.

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Alkyl halides
aq. NaOH → Alcohol
alc. KOH, −HX → Alkene

[2] Hydrolysis of alkyl halides:

$R-X + aq.\ NaOH \longrightarrow R-OH + NaX$
X: Cl, Br, I — Alcohol

alc. KOH, −HX → C=C (Alkene)

e.g. $CH_3-\underset{Cl}{CH}-CH_2-CH_3 \xrightarrow{aq.\ NaOH} CH_3-\underset{OH}{CH}-CH_2-CH_3 + NaCl$

$CH_3-\underset{Cl}{CH}-CH_2-CH_3 \xrightarrow[-HX]{alc.\ KOH} CH_3-CH=CH-CH_3$

[3] Reduction of Carbonyl compounds: $-\overset{O}{\overset{\|}{C}}-$

General: $R_1-\overset{O}{\overset{\|}{C}}-R_2 \xrightarrow{[H]} R_1-\overset{OH}{\overset{|}{C}}H-R_2$

[H]: Reduction by H_2/Ni, $LiAlH_4$, $NaBH_4$

Ex.

$CH_3-\overset{O}{\overset{\|}{C}}H \xrightarrow{LiAlH_4} CH_3-\overset{OH}{\overset{|}{C}}H_2$

Acetaldehyde — 1° alcohol

$CH_3-\overset{O}{\overset{\|}{C}}-CH \xrightarrow{NaBH_4} CH_3-\overset{OH}{\overset{|}{C}}H-CH_3$

2° alcohol

[4] Reduction of Carboxylic acids

$R-(CO)OH \xrightarrow{LiAlH_4} R-(CH_2)-OH$

1° Alcohol

e.g. $CH_3-COOH \xrightarrow{LiAlH_4} CH_3-CH_2-OH$

Acetic acid — Ethanol

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Reactions of alcohols :-

- $R-O-H$
- $R\overset{\delta+}{-}O-H$ at CH gp.
- $R-O\overset{\delta+}{-}H$ at acidic hydrogen

R_3OH تفاعلات على كسر الرابطة بين

O و H تفاعلات على كسر الرابطة بين

$$\overset{\delta-}{O} \longrightarrow \overset{\delta+}{H}$$

slightly acidic

"A" Reactions due to $RO\overset{\delta+}{-}\overset{\delta+}{H}$:- slightly acidic

① Reactions with metals.

$$C_2H_5OH + Na \longrightarrow C_2H_5ONa + H_2\uparrow$$

Ethanol — Sodium ethoxide (alkoxide)

فلما slightly

CH_3-	$\equiv Me$	CH_3OH	$\equiv MeOH$
C_2H_5-	$\equiv Et$	C_2H_5OH	$\equiv EtOH$
C_3H_7-	$\equiv Pr$	$C_3H_7-CH_2CH_2OH$	$\equiv PrOH$

محلل.

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③ Dehydration of alcohols $\xrightarrow{\text{Conc. } H_2SO_4}$ Alkene.

e.g. $CH_2(H)-CH_2(OH) \xrightarrow[-H_2O]{\text{Conc } H_2SO_4} CH_2=CH_2$

Ethanol → Ethene

---

④ Ester formation (Reaction with carboxylic acids).

General: alcohol + Carboxylic acid ⟶ Ester + H_2O

e.g. $C_2H_5OH + CH_3COOH \xrightarrow{-H_2O} CH_3COOC_2H_5$

Ethanol — Acetic acid — Ethyl acetate

---

⑤ Oxidation of alcohols: → يعرفين ١، ٢، ٣ انواع شنو الكحولات

Reagents: → $K_2Cr_2O_7$ Pot. dichromate

→ $KMnO_4$ Pot. Permenganate

→ Cu / 250°C.

e.g. $CH_3-CH_2(OH) \xrightarrow[\Delta]{KMnO_4} CH_3-CH(=O) \xrightarrow{[O]} CH_3COOH$

Ethanol | 1° alcohol — Acetaldehyde ⇐ aldehyde — Acetic acid ⇐ Carboxylic acid

---

$CH_3-CH(OH)-CH_3 \xrightarrow[\Delta]{K_2Cr_2O_7} CH_3-C(=O)-CH_3$

2° alcohol — Acetone ⇐ Ketone

$CH_3-C(OH)(CH_3)-CH_3 \xrightarrow[\Delta]{[O]}$ no reaction / no oxidation

3° alcohol

1° alcohol → aldehyde → Carboxylic acid

2° alcohol → Ketone

3° alcohol → no reaction

ALKADIR.net

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⑥ Iodoform (Reaction with iodine) → يميز بين كحولات فيها CH_3 وكحولات مفيهاش

for $CH_3-\underset{OH}{\underset{|}{CH}}-R$ alcohols $\xrightarrow[NaOH]{Excess\ 3I_2}$ CHI_3 + $NaOOC-$

Iodoform — Sodium salt of carboxylic acid.

eg. $CH_3-\underset{OH}{\underset{|}{CH}}-CH_2$ $\xrightarrow[NaOH]{3I_2}$ CHI_3 + $NaOOCH$

Iodoform — Sodium formate.

Mechanism:

[1] Oxidation:

$CH_3-\underset{OH}{\underset{|}{CH}}-CH_2$ $\xrightarrow{I_2}$ $CH_3-\overset{O}{\overset{\|}{C}}H$ → gives aldehyde or ketone

[2] Replacement:

$CH_3-\overset{O}{\overset{\|}{C}}H$ $\xrightarrow[NaOH/\Delta]{3I_2}$ CI_3-CHO

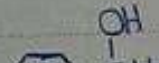
[3] Hydrolysis:

CI_3-CHO $\xrightarrow{NaOH}$ CHI_3 + $NaO\overset{O}{\overset{\|}{C}}-H$

iodoform — Sod. formate

e.g. $CH_3-\underset{OH}{\underset{|}{CH}}-CH_2-CH_3$ $\xrightarrow[NaOH/\Delta]{3I_2}$ CHI_3 + $NaOOC-CH_2-CH_3$

iodoform

eg.  $\xrightarrow[NaOH/\Delta]{3I_2}$ CHI_3 + 

iodoform — Sodium benzoate

eg. $CH_3-\underset{OH}{\underset{|}{CH}}-CH_2$ $\xrightarrow[NaOH/\Delta]{3I_2}$ CHI_3 + $NaOOCH$

sodium formate

→ How can you differentiate between: 2-pentanol & 3-pentanol

2-Pentanol $CH_3-\underset{OH}{\underset{|}{CH}}-CH_2-CH_2-CH_3$ $\xrightarrow[NaOH/\Delta]{Excess\ I_2}$ CHI_3 + $NaOOC-CH_2-CH_2-CH_3$

3-Pentanol $CH_3-CH_2-\underset{OH}{\underset{|}{CH}}-CH_2-CH_3$ $\xrightarrow[NaOH/\Delta]{Excess\ I_2}$ no reaction

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Ether (R-O-R)

H-O-H water
R-O-H Alcohol
R-O-R Ether

Nomenclature "common"

↪ Alkyl Alkyl ether.

CH_3-O-CH_3 Diethyl ether

$C_2H_5-O-C_2H_5$ Dimethyl ether

$CH_3-O-C_2H_5$ ethyl methyl ether.

$CH_3-O-CH(CH_3)(CH_3)$ isopropyl methyl ether

Preparation methods:

1. heating of two moles of alcohols at 140°C in Conc. H_2SO_4 → gives Symmetric ether

→ $2CH_3-OH \xrightarrow[140°C]{Conc\ H_2SO_4} CH_3-O-CH_3$ Dimethyl ether

→ $CH_3-OH-HO-CH_3 \xrightarrow[140°C]{Conc.\ H_2SO_4} CH_3-O-CH_3$

→ $2C_2H_5OH \xrightarrow[140°C]{Conc\ H_2SO_4} C_2H_5OH$

important

2. Williamson ether Synthesis (gives Un.Symmetric ether).

• Heating of Sodium alkoxide with alkyl halide.

General: $R-OH \xrightarrow{Na} R-O^-Na^+ + Cl-R' \xrightarrow{-NaCl} R-O-R'$

Sodium alkoxide

→ Starting from ethanol, How could you prepare ethyl-methyl ether. → $CH_3-O-C_2H_5$

Answer:

$C_2H_5-OH \xrightarrow{Na} C_2H_5-O^-Na \xrightarrow[-NaCl]{CH_3-Cl} C_2H_5-O-CH_3$

Sod. ethoxide ethyl-methyl ether

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Aldehydes & ketones ($-\overset{O}{\overset{\|}{C}}-$) Carbonyl group.

$-\overset{O}{\overset{\|}{C}}-H$ Aldehyde

$R-\overset{O}{\overset{\|}{C}}-R$: Ketone

IUPAC nomenclature : aldehydes $-\text{ane} \rightarrow \text{al}$

$CH_3-\overset{O}{\overset{\|}{C}}-H$

methanol

$CH_3-\underset{CH_3}{CH}-CH_2-\overset{O}{\overset{\|}{C}}-H$

3-methyl butanol

$CH_3-CH=CH-\overset{O}{\overset{\|}{C}}-H$

2-buteral (but-2-en-al)

Common nomenclature: Aldehydes.

$H-\overset{O}{\overset{\|}{C}}-H$ / $H-CHO$ / CH_2O

formaldehyde

$CH_3-\overset{O}{\overset{\|}{C}}-H$ / CH_3-CHO

Acetaldehyde

$CH_3-CH_2-\overset{O}{\overset{\|}{C}}-H$ / CH_3-CH_2-CHO

Propionaldehyde

IUPAC nomenclature : ketones $-\text{ane} \rightarrow \text{one}$.

$CH_3-\overset{O}{\overset{\|}{C}}-CH_3$

Propanone

$\overset{5}{CH_3}-\underset{CH_3}{\overset{4}{CH}}-\overset{3}{CH_2}-\overset{2}{\overset{O}{\overset{\|}{C}}}-\overset{1}{CH_3}$

4-methyl-2-Pentanone

(pentan-2-one)

$CH_3-CH=CH-CH_2-\overset{O}{\overset{\|}{C}}-CH_3$

4-hexen-2-one

Common nomenclature: ketones

$CH_3-\overset{O}{\overset{\|}{C}}-CH_3$

Acetone

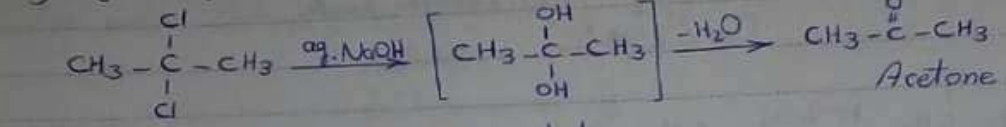


Acetophenol

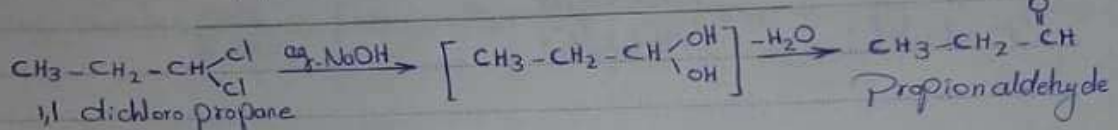
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Preparation of aldehydes & ketones:

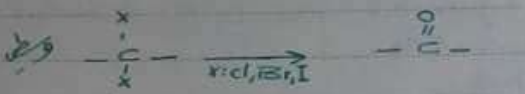
[1] Hydrolysis of geminal dihalides



2,2 dichloro propane — geminal dion



1,1 dichloro propane

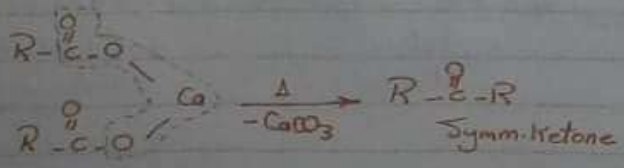


[2] Reduction of acid chloride ($R-\overset{O}{\overset{\|}{C}}-Cl$):

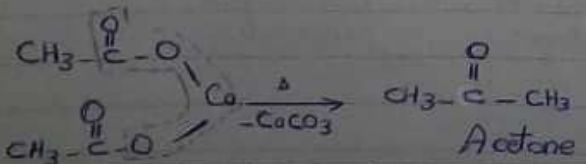
General: $R-\overset{O}{\overset{\|}{C}}-Cl \xrightarrow[Pd-BaSO_4]{H_2} R-\overset{O}{\overset{\|}{C}}-H$ aldehyde

e.g. $CH_3-\overset{O}{\overset{\|}{C}}-Cl \xrightarrow[Pd-H_2SO_4]{H_2} CH_3-\overset{O}{\overset{\|}{C}}-H$ Acetaldehyde

[3] Decarboxylation of calcium salts of acids:



example



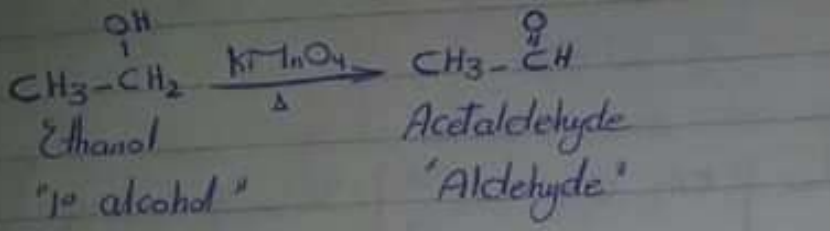
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[4] Oxidation of alcohols:

Reagents: $K_2Cr_2O_7$ Pot. dichromate.

$KMnO_4$ Pot. permenganate.

Cu / 250 °C

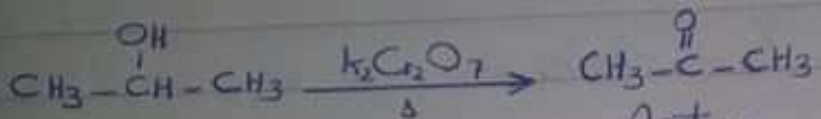


Ethanol

"1° alcohol"

Acetaldehyde

"Aldehyde"

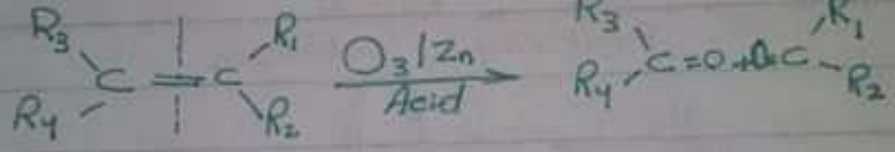


2° alcohol

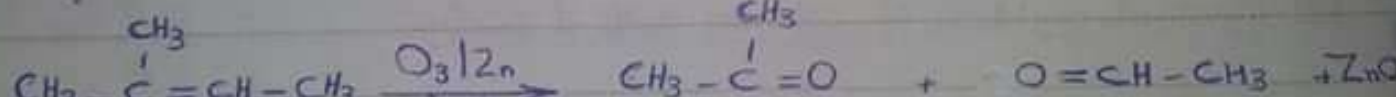
Acetone

"Ketone"

[5] Ozonolysis of alkenes

General: 

Example:

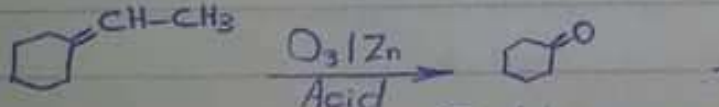


Acetone

"ketone"

Acetaldehyde

"Aldehyde"



Cyclohexanone

"ketone"

Acetaldehyde

"Aldehyde"

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[6] Hydration of alkynes:

$$R-C\equiv CH \xrightarrow{H_2O} [\,R-C(OH)=CH_2\,] \longrightarrow R-\underset{\displaystyle O}{\overset{\displaystyle \|}{C}}-CH_3$$

unstable Enol compound — Ketone

$$CH_3-C\equiv CH \xrightarrow[\text{dil. } H_2SO_4]{HgSO_4} [\,CH_3-C(OH)=CH_2\,] \longrightarrow CH_3-\underset{\displaystyle O}{\overset{\displaystyle \|}{C}}-CH_3$$

Acetone "Ketone"

$$CH\equiv CH \xrightarrow[\text{dil. } H_2SO_4]{HgSO_4} [\,CH(OH)=CH_2\,] \longrightarrow O=CH-CH_3$$

Acetaldehyde "Aldehyde"

Reactions of aldehydes & Ketones:

Alkene: $>C=C<$ → HCl → Mark rule

Carbonyl group: $>C=O$ (δ^+ on C, δ^- on O) → Polarized group مجموعة مستقطبة → HCl → $-\underset{Cl}{\overset{OH}{C}}-$

[I] Nucleophilic addition at carbonyl group:

Nucleophile : $Nu^{\ominus}$ نيوكليوفيل

Electrophile : $E^{\oplus}$ إلكتروفيل

General: $-\underset{\displaystyle O}{\overset{\displaystyle \|}{C}}- \xrightarrow{Nu-H} -\underset{Nu}{\overset{OH}{C}}-$

(A) Addition of grignard reagent (R^-Mg^+) → يقول الكيمياء أن إضافة الكحول إلى الإيثانال مع زيادة من كواشف الديوكس.

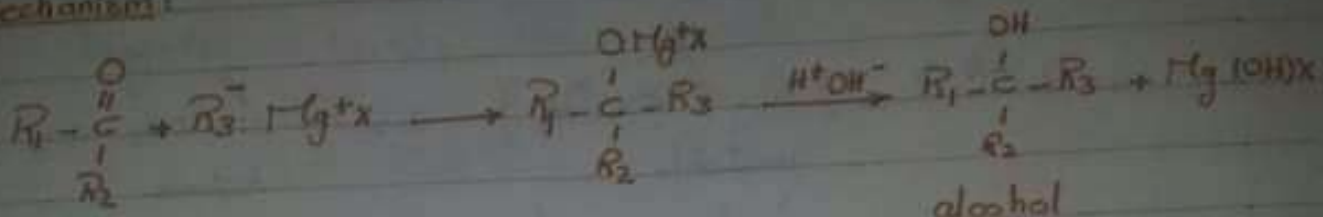
$$R-X + Mg \xrightarrow{\text{ether}} R^-Mg^+-X$$

alkyl halide — Grignard reagent

$$R_1-\underset{R_2}{\overset{\displaystyle O}{\overset{\displaystyle \|}{C}}} + R_3^-Mg^+X \xrightarrow{H_2O} R_1-\underset{R_2}{\overset{OH}{C}}-R_3$$

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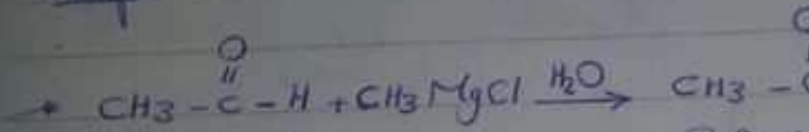
Mechanism:



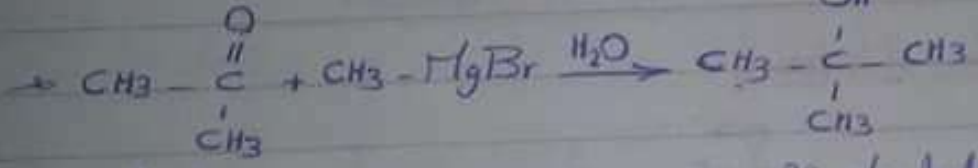
alcohol

ضد ذرات الكربون فيه بتزيد عن بلكون بدصولين

example

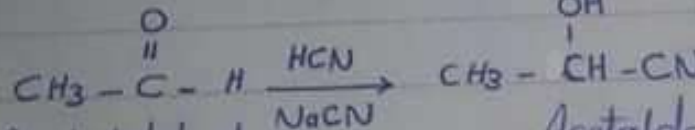


Acetaldehyde — 2-propanol (2° alcohol)

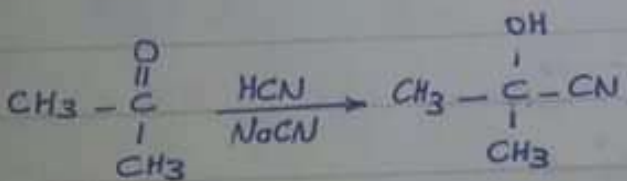


Acetone — 3° alcohol

(B) Addition of HCN



Acetaldehyde — Acetaldehyde Cyanohydrine



Acetone — Acetone Cyanohydrine

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Cyclohexane C_6H_{12}

Cyclohexene C_6H_{10}

Cyclohexa-2-one C_6H_8

Benzene C_6H_6

[2] Addition followed by H_2O elemination:

General: $>C=O + H_2N- \xrightarrow{-H_2O} >C=N-$

example:

① $CH_3-\overset{O}{\overset{\|}{C}}-CH_3$ + $H_2N-NH-CH_3$ $\xrightarrow[-H_2O]{\Delta}$ $CH_3-\overset{N-CH_3}{\overset{\|}{C}}-CH_3$

Acetone — methyl amine — Acetone imine

② $CH_3-\overset{O}{\overset{\|}{C}}-CH_3$ + H_2N-NH_2 $\xrightarrow[-H_2O]{\Delta}$ $CH_3-\overset{N-NH_2}{\overset{\|}{C}}-CH_3$

Acetone — Hydrazine — Acetone hydrazone.

③ $CH_3-\overset{O}{\overset{\|}{C}}-H$ + $H_2N-NH-ph$ $\xrightarrow[-H_2O]{\Delta}$ $CH_3-\overset{N-NH-ph}{\overset{|}{C}}-H$

Acetaldehyde — Phenyl hydrazine — Acetaldehyde phenyl Hydrazone.

④ $CH_3-\overset{O}{\overset{\|}{C}}-H$ + H_2N-OH $\xrightarrow[-H_2O]{\Delta}$ $CH_3-\overset{N-OH}{\overset{|}{C}}-H$

Acetaldehyde — Hydroxyl amine — Acetaldehyde oxime

⑤ $CH_3-\overset{O}{\overset{\|}{C}}-CH_3$ + $H_2N-NH-\overset{O}{\overset{\|}{C}}-NH_2$ $\xrightarrow[-H_2O]{\Delta}$ $CH_3-\overset{N-NH-\overset{O}{\overset{\|}{C}}-NH_2}{\overset{\|}{C}}-CH_3$

Acetone — Semi Carbazide — Acetone Semi-Carbazone.

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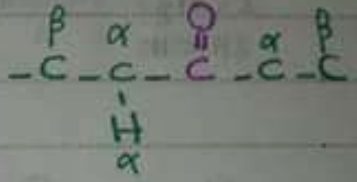
⑤ $CH_3-\overset{O}{\overset{\|}{C}}-CH_3$ + $H_2N-NH-\overset{O}{\overset{\|}{C}}-NH_2 \xrightarrow[-H_2O]{\Delta}$ $CH_3-\overset{N-NH-\overset{O}{\overset{\|}{C}}-NH_2}{\overset{\|}{C}}-CH_3$

Acetone — Semi Carbazide — Acetone Semi-Carbazone

---

[3] Base Catalyzed reactions:

α-Carbon (α-Hydrogen)



$CH_3-\overset{O}{\overset{\|}{C}}-H$ — 3 α Hydrogen

$CH_3-CH_2-\overset{O}{\overset{\|}{C}}-CH_3$ — 2αH, 3αH, 5αH

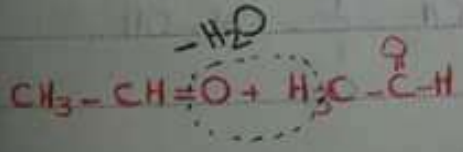
① Aldol condensation:

Condensation of two moles of aldehydes / ketones at least one of them contain 2 α-hydrogen.

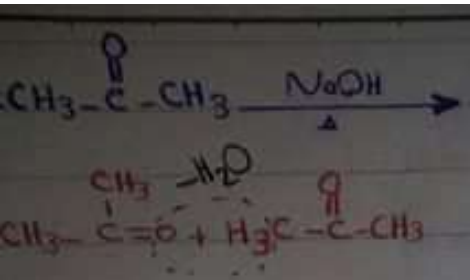
$2CH_3-CHO \xrightarrow[\Delta]{NaOH} CH_3-CH=CH-\overset{O}{\overset{\|}{C}}-H$

Crotonaldehyde

α,β unsaturated aldehyde



Scanned by CamScanner



a, β unsaturated ketone

Suggest one method to prepare:

(a) $CH_3-CH=CH-CHO \xleftarrow[NaOH]{\Delta} CH_3-CHO + H_3C-CHO$

← الطرف اللي فيه كربونيل (C=O) هيديله 2H

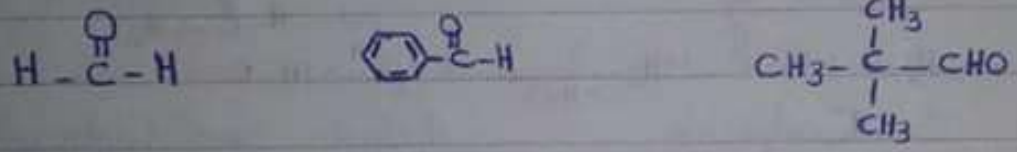
واللي مفهوش كربونيل هيديله O

(b) $CH_3-C(=O)-CH=CH-C(=O)-CH_3 \xleftarrow[\Delta]{NaOH} CH_3-C(=O)-CH_3 + H_3C-C(=O)-CH_3$

---

② Cannizzaro's reaction:

Reaction of two moles aldehydes / ketones with no α-H atom.



- example

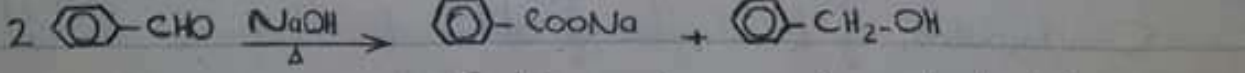
$$2CH_2O \xrightarrow[\Delta]{NaOH} HCOONa + CH_3OH$$

2H-CHO — Sod. formate — methanol

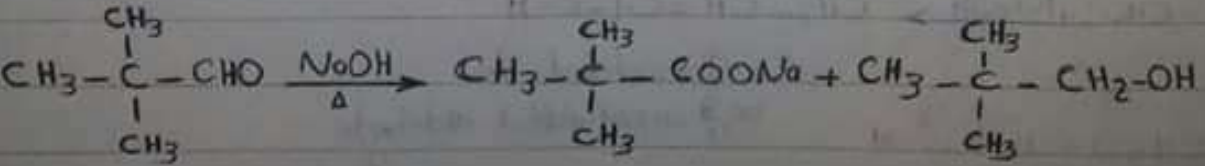
← واحد عملية أكسدة والتاني عملية اختزال

H-CHO $\xrightarrow{\text{Oxidation}}$ HCOONa → Salt of acid

H-CHO $\xrightarrow{\text{Reduction}}$ CH_3OH → alcohol



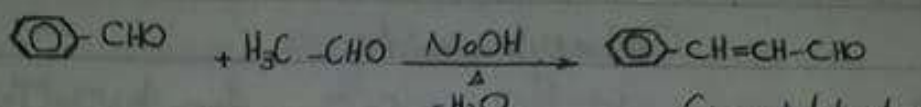
Sod. benzoate — benzyl alcohol



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③ Claisen condensation:

Occur between benzaldehyde (no α-H) with aldehyde / ketone (two α-hydrogen).



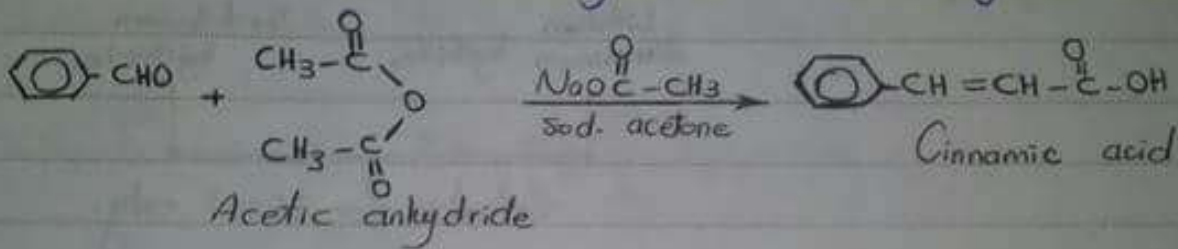
Cinnaldehyde

$C_6H_5-CHO \equiv$  $\equiv Ph-CHO$

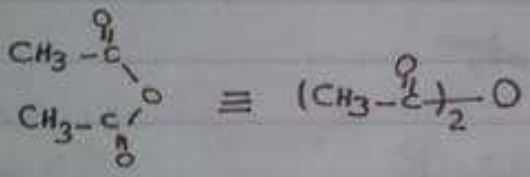
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④ Perkin reaction

Reaction of benzaldehyde with acetic anhydride → Cinnamic acid



Cinnamic acid



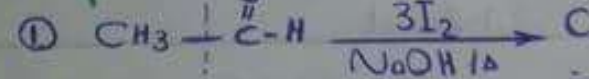
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⑤ Iodoform formation — base catalyzed reaction - التفاعل من القاعدة

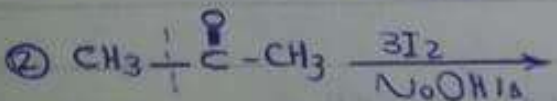
↳ methyl aldehyde or ketone only.

(presence of 3α-H). $CH_3-C(=O)-$

Examples:

① 

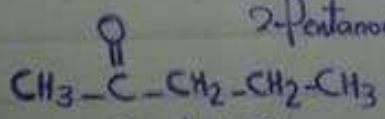
iodoform — Sod. formate

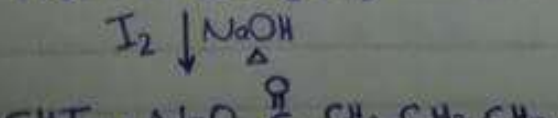
② 

Sod. acetate

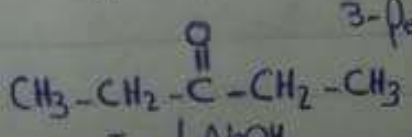
- How can you differentiate between 2-pentanone & 3-pentanone?!

2-Pentanone





3-Pentanone



no Iodoform

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⑤ Oxidation of aldehydes / ketones

↳ Oxidation of aldehyde into Carboxylic acid

$$R-CHO \xrightarrow{[O]} R-COOH$$

Carboxylic acid

* Oxidizing agent: air oxygen - $KMnO_4$ - $K_2Cr_2O_7$ - Amm. $AgNO_3$ (Tollen's reagent).

---

⑥ Reduction of aldehydes / ketones $-\overset{O}{\overset{\|}{C}}- \xrightarrow{[H]} -\overset{OH}{\underset{|}{C}}H-$

(A) $R_2-\overset{O}{\overset{\|}{C}}-R_1 \xrightarrow{[H]} R_1-\overset{OH}{\underset{|}{C}}H-R_2$

Reducing agent: H_2/Ni , $LiAlH_4$, $NaBH_4$

Lithium Aluminum hydride — Sod. boron hydride

Selective for (C=O) only.

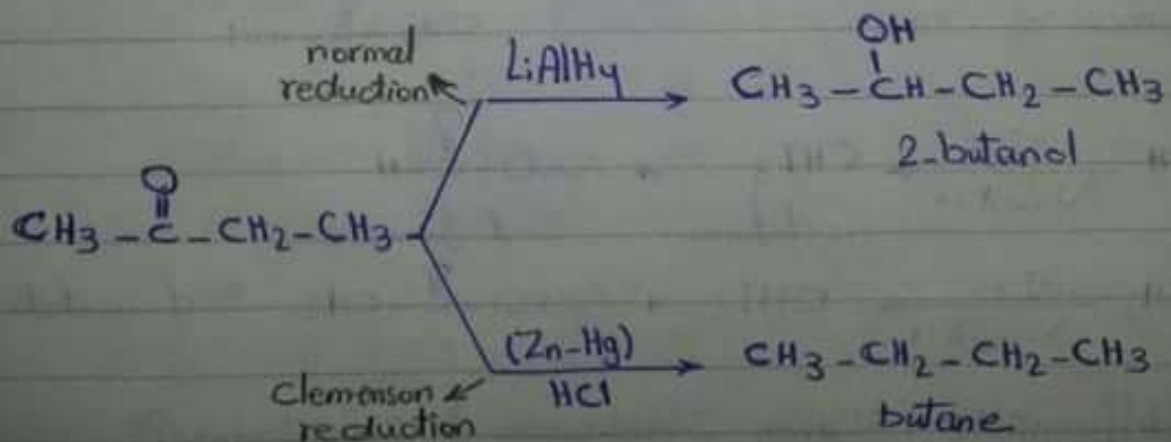
(B) Clemenson Reduction

$$R_2-\overset{O}{\overset{\|}{C}}-R_1 \xrightarrow[HCl]{(Zn-Hg)} R_2-CH_2-R_1$$

Zinc amalgam

Alkane

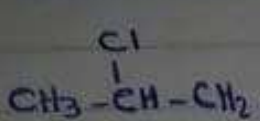
- بهم طرق تحضير الكحول



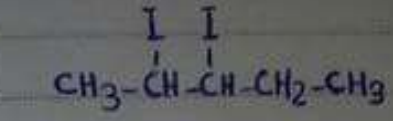
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Alkyl halides : R-X (X: F, Br, Cl, I)

Nomenclature **IUPAC** → halo alkane

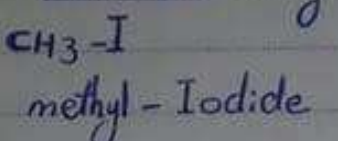


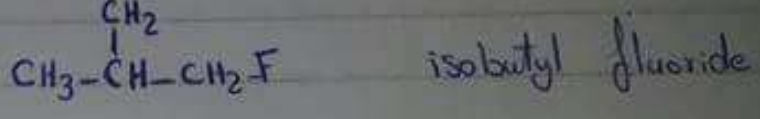
2-Chloro butane.



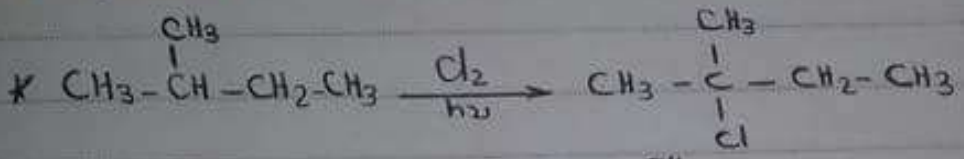
2,3 di-iodo Pentane

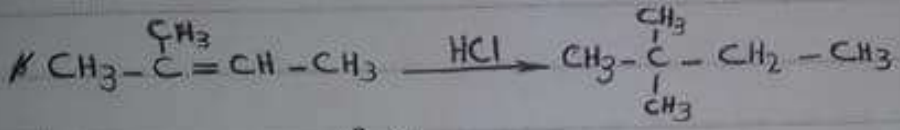
common: Alkyl halide

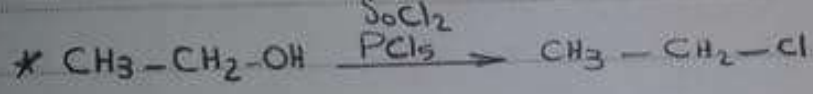


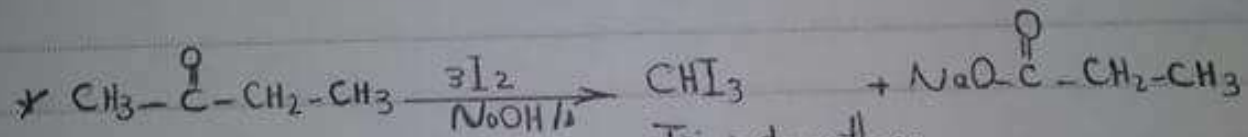


Preparations:

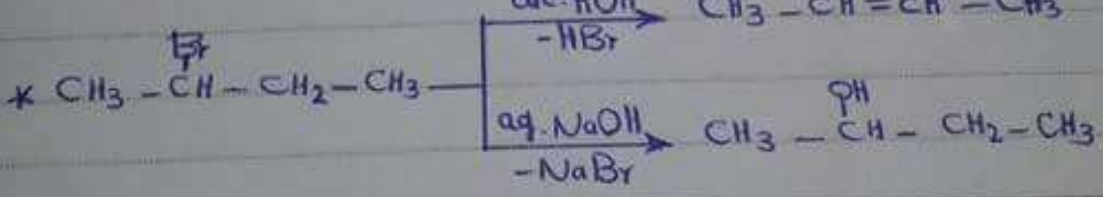






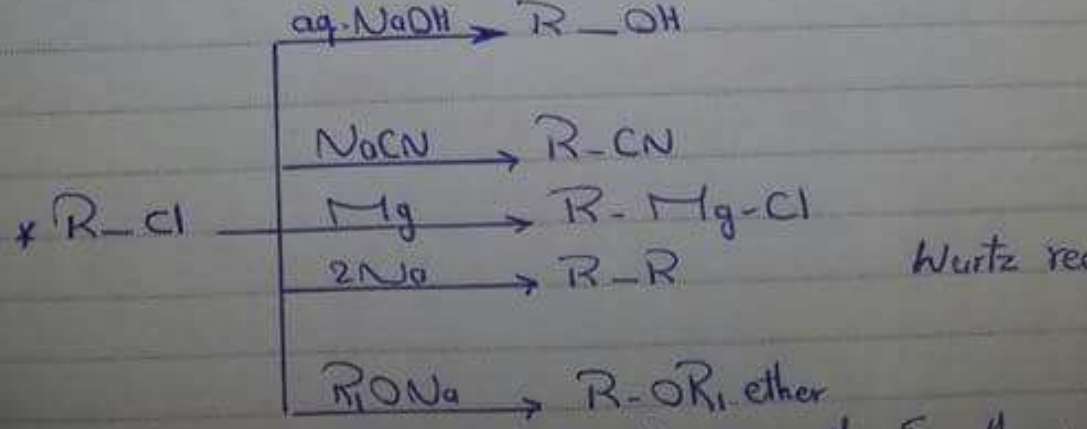


Reactions:



E2 elimination reaction (alc.KOH)

Substitution



Wurtz reaction

Williamson ether Synthesis for unsymmetric ether).

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